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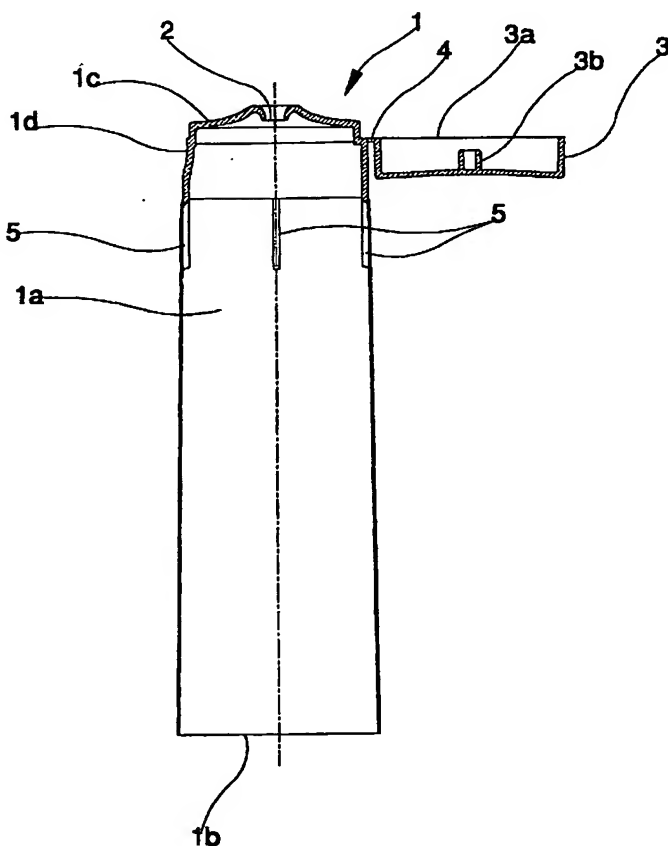
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(54) Title: A PLASTIC SINGLE-PIECE TUBE



(57) Abstract: The tube, in particular for containing fluid products such as creams and cosmetic products in general, comprises: a trunco-conical body (1a) having a lower part (1b) which is open for introduction of the product, and can be closed after the introduction; and also comprises an upper part (1c) affording a passage for exit of the product from the tube. A cap (3) can be applied on the upper part (1c) of the tube for closing the passage and is connected to the upper part (1c) of the tube by a hinge element (4). The tube, the cap (3) and the hinge element (4) are all made in a single piece obtained by injection moulding.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## Description

### A Plastic single-piece Tube

#### **Technical Field**

The invention relates to a single-piece tube made of plastic. For some time plastic tubes have been used in substitution for metal tubes, especially in the technical field of tubes destined to contain fluid products such as creams or in general cosmetic products.

#### 5 **Background Art**

The tubes in this field usually include a central body having a lower part which is open for the introduction of the product, and which is closed after the filling operation. The upper part of the central body has a passage for the exit of the product from the tube. These tubes are made by either welding the upper part to  
10 a drawn cylindrical tube, or by directly moulding the whole tube by injection of plastic material in a special die. The present invention relates in particular to the latter type of tube.

The finished tube is sent to producers of the product destined to fill the tube by introduction into the open lower part, whereupon the bottom of the tube is  
15 welded, the top of the tube is closed by a cap, usually screwed on by means of a thread located at the opening, which the user will then unscrew to access the product, and rescrew to seal the tube until next use.

As with all objects whose unit cost is relatively low but which are produced in large numbers, the main problem the producers face is how to limit costs and  
20 production times, by limiting the number of separate parts needed to make the object and by reducing to a minimum production waste. A further problem faced

is how to reduce space and despatch and storage costs.

A further problem is how to facilitate both intermediate and final use.

The main aim of the present invention is to make a single-piece tube of a plastic material which contributes much to reducing production and storage costs, and  
5 which facilitates the use of the final product.

An advantage of the invention is to provide a tube whose external surface has a good finish, obtained during the moulding operation.

A further advantage of the invention is that it provides a tube having high mechanical resistance.

10 These aims and advantages and others besides are all achieved by the present invention, as it is characterised in the appended claims.

### **Disclosure of Invention**

Further characteristics and advantages of the present invention will better emerge from the detailed description that follows, of some preferred but not exclusive  
15 embodiments thereof, illustrated purely by way of example in the accompanying figures of the drawings, in which:

figure 1 is a section in vertical elevation of a first embodiment of the tube of the invention;

figure 2 is a reduced-scale view of a section of two tubes as in figure 1, one  
20 inserted in another;

figure 3 shows a section of two tubes, slightly differently made with respect to those illustrated in figures 1 and 2, one inserted in another.

In figures 1 and 2, 1 denotes a single-piece tube made of plastic. The plastic material used can be of known type and is suitable for injection-moulding.

25 The tube comprises a trunco-conical body 1a which exhibits a coning angle of between 1° and 4° and which has an open lower part 1b. In filling plants this open lower part 1b is used to fill the tube. The lower part 1b of the tube can be

closed after the introduction of the fluid product, for example by hot-welding.

The tube is further provided with an upper part 1c, which in this embodiment is an integral part of the tube, in which a passage is provided for exit of the product from the tube during use of the product by the final user. The passage 1c  
5 comprises a cylindrical hole 2 which opens conically towards the outside and which is arranged coaxially to the tube 1.

The tube 1 further comprises a cap 3 conformed so as to cover the upper part 1c of the tube and close the cylindrical hole 2. The cap 3 comprises a cylindrical projection 3b fashioned on the internal bottom of the cap 3, which inserts  
10 sealingly in the cylindrical hole 2 when the cap 3 is placed on the upper part 1c of the tube.

The cap 3 is connected to the upper part 1c of the tube by a hinge element 4 which comprises a flat band 4 which connects an intermediate zone of the upper part 1c of the tube to a free edge 3a of the cap 3. The upper part 1c of the tube  
15 and the cap 3 are conformed in such a way that the cap 3, when placed on the upper part 1c of the tube to close the hole 2, is in fact a continuation of the trunco-conical body of the tube 1.

To facilitate removal of the cap 3 from the upper part of the tube, i.e. to open the tube 1, a slight recess 1 is afforded on the lateral wall of the upper part 1c of the tube 1, which recess reveals a short tract 3c of cap 3 below which a user's finger  
20 can insert, press and remove the cap 3. The recess 1d is afforded in a diametrically-opposite position to the hinge element 4.

The tube 1, the cap 3 and the hinge element 4 are all made in a single piece during the injection-moulding of the tube 1. In particular, the tube 1 is obtained  
25 using the known process of multiple injections of material internally of a mould. In this way the hinge element 4 is made together with the cap 3 by injection of plastic material of a different colour to that used for the remaining part of the tube

1.

The upper part 1c of the tube 1 and the cap 3 are slightly thicker than the trunco-  
conical body of the tube 1. In a brief tract of tube 1 between the upper part of the  
tube and the remaining part of the tube 1, there are thin internal ribs 5 which are  
5 arranged in a radial direction. In particular, in the illustrated tube, four ribs are  
present and located equidistant from each other. This particular conformation of  
the upper part 1c of the tube 1 enables a greater consistency to be obtained for  
that part of the tube, and facilitates the exit of the product from the tube 1. This  
greater consistency does not however constitute an obstacle to the squeezing of  
10 the tube 1 to cause the product to exit, which in fact does happen with some  
known tubes, such as for example those tubes made using the technique of  
welding the upper part of the tube to an extruded tube body. In this kind of  
realisation, the welding zone becomes a little stiffer, which makes the tube  
difficult to squeeze. The internal ribs 5 also have a further important function in  
15 relation to the stocking of the tubes, as will be better explained herein below.

The tube of the invention, which is made together with the cap in a single  
moulding process, confers high productivity on the moulds. Its shape also makes  
the tubes easy to stack, as shown in figure 2, in piles which can include a large  
number of tubes, all in one piece with their caps 3. This makes for very  
20 considerable savings in transport costs for the empty tubes to the users. In  
particular, the tubes can be inserted one in another but will not stick to each other,  
thanks to the presence of the ribs 5 which stop axial-direction penetration of one  
tube in another and render their uncoupling very easy. This function could  
obviously be performed by ribs or stops of different shape and location to the  
25 ones illustrated.

The tube can be made using parts of different colours. Also, as there are no glued  
or superposed parts, the tube exhibits considerable mechanical resistance. The

tube described further exhibits a surface finishing, both internal and external, which is of very high quality, obtained directly during the moulding stage without any further operations being necessary, as in other known tubes. This gives greater slidability of the product inside the tube, and eliminates or at least renders

5 easier any external surface finishing operations.

Finally, the presence of the cap made directly during the tube-manufacturing process, and therefore solidly connected to the tube, not only facilitates production, storage and transport, but also makes the tube easier to use for the final user.

10 The above-described solution is preferable inasmuch as it provides a greater number of advantages with respect to the prior art. It is, however, possible to realise the upper part of the tube (which in this version is not destined to contain product and strictly speaking is not even a part of the tube) the cap and the hinge element as a separate part which is then connected to the tube, for example by  
15 means of a known-type connection of a screw- or joint-type, between the upper part and the tube itself. This solution, illustrated in figure 3, would not offer the advantages connected with a single moulding process producing the tube together with the hinge and cap, but would still have the advantages of being easy to transport and storage, and it would still be mechanically resistant and have good  
20 finishing.

### Claims.

- 1). A plastic single-piece tube, comprising a trunco-conical body (1a) having a lower part (1b) which is open for introduction of a product and closeable after the introduction, and an upper part (1c) provided with a passage for exit of the product, wherein the tube comprises a cap (3) which can be applied on the upper part (1c) of the tube for closing the passage, which cap (3) is connected to the upper part (1c) of the tube by a hinge element (4); at least the upper part (1c) of the tube, the cap (3) and the hinge element (4) being made in a single piece obtained by injection moulding.
- 2). The tube of claim 1, wherein the upper part (1c) and the cap (3) are conformed in such a way that the cap (3) applied on the upper part (1c) is a continuation of the trunco-conical body (1a) of the tube.
- 3). The tube of claim 1, wherein the whole tube, together with the cap (3), is made in a single piece by multiple injections of plastic material into a mould.
- 4). The tube of claim 3, wherein the hinge element (4) and the cap (3) are made by injection of plastic material of different colours with respect to a colour used for a remaining part of the tube.
- 5). The tube of claim 1, wherein the upper part (1c) of the tube and the cap (3) are slightly thicker than the trunco-conical body (1a) of the tube.
- 6). The tube of claim 1, wherein in a brief tract of the tube situated between the upper part (1c) and the remaining part of the tube internal thin ribs (5) are fashioned.
- 7). The tube of claim 1, wherein the hinge element (4) comprises a flat band (4) which connects an intermediate zone to the upper part (1c) of the tube to a free edge (3a) of the cap (3).



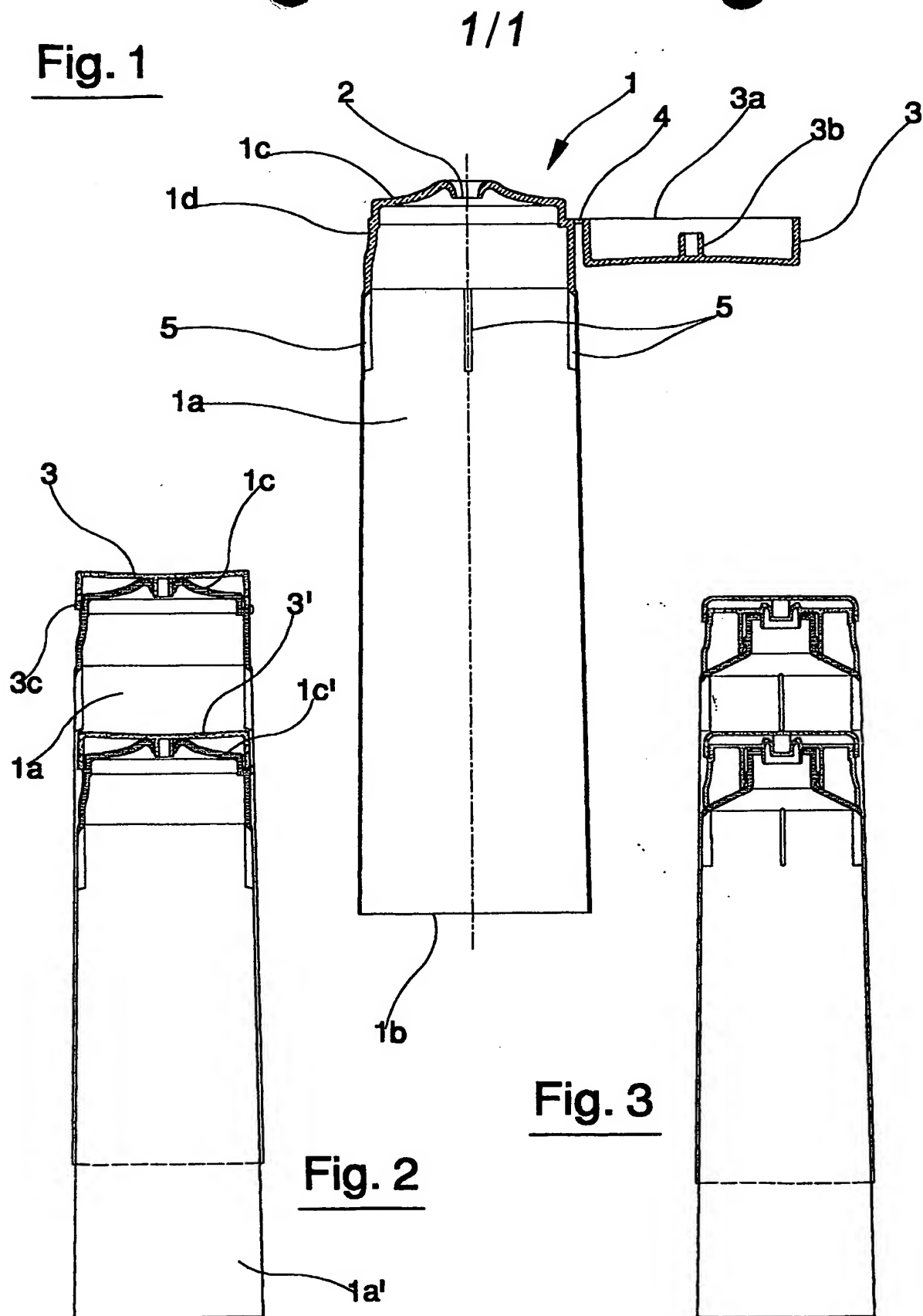
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8). The tube of claim 1, wherein: the passage afforded on the upper part (1c) of the tube comprises a cylindrical hole (2) which opens conically towards an outside and is arranged coaxially to the tube (1); the cap (3) comprises a cylindrical projection (3b), fashioned on an internal bottom of the cap (3), which  
5 is conformed and arranged in such a way as to insert sealingly in the cylindrical hole (2) when the cap (3) is applied on the upper part (1c) of the tube.

9). The tube of claim 1, wherein a coning angle of the trunco-conical body is comprised between  $1^{\circ}$  and  $4^{\circ}$ .

10). The tube of claim 2, wherein on a lateral wall of the upper part (1c) of the  
10 tube a recess (1d) is afforded, made at a diametrically-opposite position to the hinge element (4) which, when the cap (3) is applied on the upper part (1c) of the tube, reveals a brief tract (3c) of cap (3).

**Fig. 1**



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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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